Is Your SCR System Ready for Year Round Operation?

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Summary

To date the predominance of SCR systems in the United States are operated on an Ozone Season (May to September) basis for the control of nitrogen oxides emissions. Consequently, these plants generally isolate (lay-up) the catalyst for the seven month non-Ozone Season. However, as a result of regulatory changes operation of most US SCR systems will become year round in 2009. Year round SCR system operation will present a number of challenges and result in increased costs.

A number of items should be considered prior to transitioning to year round operation including the following.

- Eliminate the potential for large particle (LPA) ash depositing on the catalyst. LPA pluggage can lead to very high pressure drops and mechanical damage to the catalyst. Durable screen designs are highly desirable to support scheduled outage intervals. Flow modeling and physical changes may be necessary.
- Ensure carbon carryover is minimized to levels tolerable by the catalyst. All DeNOx catalyst has oxidizing properties and will tend to oxidize unburned carbon. At certain levels unburned carbon can tend to accumulate on catalyst increasing the potential for offline, out of reactor cleaning or fires.
- Ensure fly ash reliably moves through the reactor. This is especially important to support fuel switches. A number of existing SCR designs may include flow anomalies resulting in drop out, and/or are based on aggressive catalyst pitch selections that are incapable of handling the range of operations anticipated. Opportunities to remove ash from the reactor will generally be limited to scheduled outages. Flow modeling, flow path modifications, and catalyst replacements may be necessary to be properly prepared.
- Long term operation with deep staged, primary controls may result in tube wastage, forced outages and increased boiler repair costs. Economic tradeoff analyses may be necessary to determine the proper level of primary control use versus the cost of ammonia and catalyst.
- Consider long-term fuel plans to determine proper level of catalyst oxidation rates and/or use of an SO_3 removal system. Reduced ambient temperatures will result in an increased potential for a visible SO_3 plume.

- Ensure that the mechanical design of catalyst replacements match long-term management plan objectives including washing and regeneration. Thin wall construction should be avoided to ensure catalyst lifetimes exceeding 60,000 hours and opportunities for washing/regeneration.
- The range of year round operations must be accommodated. Lower ambient temperatures and increased dispatching will potentially increase the time spent below current ammonia injection permissive temperatures. Testing and system modifications may be necessary to achieve annual NO_x reduction objectives.
- Increase responsiveness and reliability of SCR system controls. A number of existing systems are struggling with or have abandoned the SCR system inlet/outlet NOx analyzers. Additionally, control logics in some circumstances are not supporting operations. Control system reliability must support longer maintenance intervals and increased NOx reduction requirements.
- Upgrade catalyst cleaning, ammonia receipt, vaporization, and transfer systems for low ambient temperature operation.
- Improve reliability of dampers. A number of existing dampers have difficulty ensuring isolation/sealing. It will be necessary to ensure actuators and seal air systems operate reliably to support isolation and operation needs.
- With year round operation there will likely be a less frequent assessment (approximately every 8,000 hours versus every 3,600 hours) of catalyst activity installed. Predictive models incorporating the range of catalyst tests, reactor inspection, and ammonia in ash measurement results will be critical to support SCR operations and maintenance planning.

Through CERAM's SCR system/catalyst management services program (CATLife®) experience has been obtained with all topics listed. However, the time available does not provide the opportunity to present in detail on all topics listed above. As such, the bulk of the presentation will focus on ash, oxidation rate, and catalyst management considerations.